Method for producing a thin-film magnetic tape head

The invention is based on a method for producing a thin-film magnetic tape head. A method of this type is known from EP-A-0233086. Known metal-in-gap (e. Sony TSS, etc.) or lamellar sendust-amorphous heads are manufactured in blocks (non-planar) and the formation of the air gap is carried out by putting together two half-blocks. Thin-film blocks like, for example, the IMB Spiral Hard Disk head, is, owing to the small gap height, not suitable for systems with tape-head contact as is required in magnetic tape devices.

A gap inclination (azimuth) can only be generated by mechanically machining the backing material (substrate).

Apart from that, such a type of magnetic tape head cannot be considered for analog systems (long tape wavelengths and secondary gap effects). Systems with azimuth are necessary for track-on-track writing without lawns (separating areas between the recording tracks).

It is the object of the invention to manufacture a magnetic tape head in thin-film technology without combining the two half-blocks.

This task is solved according to the invention by the features of the first patent claim. Advantageous further developments result from the subclaims.

The method according to the invention for manufacturing heads described below combines the advantages of planar thin-film technology and gap production with the magnetic and mechanical advantages of heads manufactured conventionally. In the following one possible exemplary embodiment is more closely explained by means of drawings. In the drawings:

Fig.1 shows a selection from a wafer according to the first and second method step,

Fig.2 shows the wafer section following a third method step,

Fig.3 shows the wafer section following a fourth method step,

Fig.4 shows the wafer section following a fifth method step,

Fig.5 shows the wafer section following a sixth and seventh method step,

Fig.6 shows the wafer section following a eighth and ninth method step,

Fig.7 shows the wafer section following a tenth to fourteenth method step.

In a first method step for manufacturing a thin-film magnetic tape head, a substrate 1 (wafer) is provided with a coating 2 which is resistant to a caustic medium for the substrate 1. The coating 2 is deposited by means of vapor-deposition, sputtering of by an oxidation process.

In a second method step, a window 3 is etched into the coating 2 by means of a photographic or photolithograpihc technique (Fig.1).

In the third step a cavity 4 is etched into the substrate 1 through the window 3 (Fig.2).

Following this, a soft magnetic material 5, for example, Sendust is deposited onto the substrate. This is preferably carried out by sputtering of the window,

whereby, in the cavity 4, a prismoid 6 formed as a part projecting upwards is produced (hour-glass effect) (Fig.3).

After this, the coating 2 and the soft magnetic material 5 deposited on this are removed, for example, by stripping (Fig4).

In a sixth method step the substrate 1 is etched away so far from both sides of the prismoid 6 that the prismoid projects out of the substrate surface.

In a seventh method step the substrate 1 is provided with a coating which serves as a gap layer 7. This is carried out by means of sputtering or vapor-deposition. The gap layer (gap spacer) later forms the non-magnetic air gap (Fig.5).

By using asymmetric etching, for example, by inclining the wafer or the etching device, the gap coating is dione etched one-sidedly, i.e. sputtered parts are not etched. Thereby, the gap coating only remains on one side of the prismoid.

Following this, a further layer 8 is deposited on to the substrate 1 and said layer also consists of a soft magnetic material such as Sendust, for example (Fig. 6).

After this, the various parts of the magnetic tape head, for example, pole shoes, winding space, etc., are shaped using a template by etching in the layer 8.

Then the substrate 1 is polished, whereby the prismoid apex (wedge apex) is removed.

After this, the head windings are manufactured on the head legs in thin-film technology.

The return path of the head windings is closed by a further soft magnetic layer.

After this, the substrate or the wafer is provided with a further thick layer 9, for example, a metal oxide such as Al_2O_3, and thereby protected (Fig.7).

Finally, the wafer is divided, ground and polished, and can then be passed on for further processing.

The process described above ahs the particular advantage that there are no limitations regarding the material and the track width of the tape for the magnetic tape head. Apart from that, a lamination is possible, whereby eddy current losses can be prevented. In addition, only one polishing procedure is required. Further, by using the process, pure silicon scanners can be manufactured because always two magnetic tape heads are so arranged on the head drum that they are located in pairs with a certain azimuth.

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Claims

1. Method for producing a thin-film magnetic tape head, characterized by the following steps:

a) A substrate (1) (wafer) is provided with a coating (layer) (2) which is resistant to a caustic medium for the substrate (1).

b) A window (3) is etched into the layer (2).

c) A cavity (4) is etched into the substrate (1) through the window (3).

d) A magnetic material (5) (e.g. Sendust) is deposited on to the substrate (1), whereby in the cavity (4), a prismoid (6) formed as a wedge projecting upwards is produced.

e) The layer (2) and the magnetic material (5) deposited thereon are removed, for example, by stripping.

f) The substrate (1) is etched away so far from both sides of the prismoid (6) that the prismoid projects out of the substrate surface.

g) The substrate (1) is provided with a layer which serves as a gap coating (7).

h) By using asymmetric etching, for example, by inclining the wafer or the etching device, the gap layer (7) is partly removed, whereby the gap layer remains on one side of the prismoid (6).

i) A further layer (8), consisting of a magnetic material (e.g. Sendust), is deposited on to the substrate (1).

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j) Various parts of the magnetic tape head, for example, pole shoes, winding space, etc., are shaped by etching in the further layer (8).

k) The substrate (1) is polished, whereby the prismoid apex (wedge apex) is removed.

l) Head windings are manufactured in thin-film technology which form the head legs of the thin-film magnetic tape head.

m) A further magnetic layer is deposited and this produces a return path for the head windings.

n) The substrate is provided with a further layer (9), for example, a metal oxide such as Al_2O_3, and thereby protected.

o) The wafer is divided, ground and polished.

2. Method according to claim 1, characterized in that the prismoid is completely raised out of the substrate.

3. Method according to claim 1, characterized in that the window 3 is etched using a photographic or photolithograpic technique.

4. Method according to claim 1 or 3, characterized in that the window (3) is rectangular-shaped.

5. Method according to claim 1 or 2, characterized in that the prismoid is formed as a prism.

6. Method according to claim 1, characterized in that the magnetic materials (5, 8) are formed as soft magnetic materials.